HP MSR20-1X Router Series

Installation Guide

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Product overview

The HP MSR20-1x Router Series includes the following models:

J#	Type
JD431A	MSR20-10
JF239A	MSR20-11
JF241A	MSR20-12
JF807A	MSR20-12-W
JF806A	MSR20-12-T
JG209A	MSR20-12-T-W(NA)
JF240A	MSR20-13
JF808A	MSR20-13-W
JG210A	MSR20-13-W(NA)

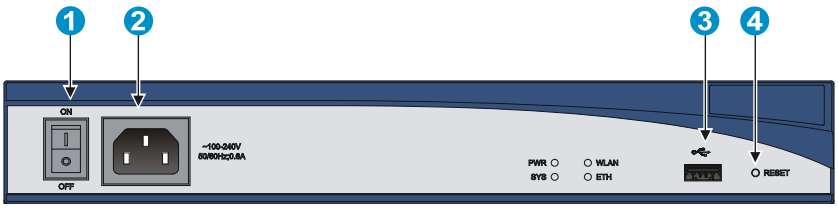
This chapter describes the chassis panel views of these routers.

NOTE:

The chassis panel views in this document are for illustration only and might slightly differ from the actual panel views.

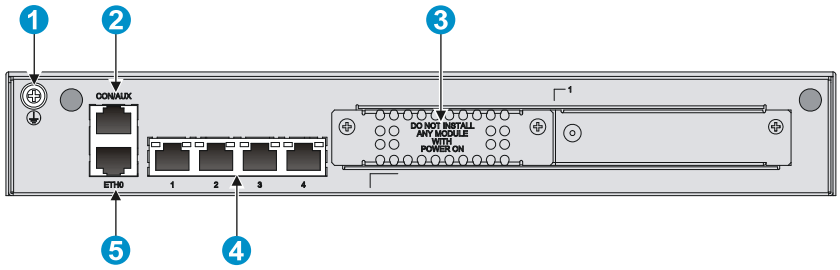
MSR20-10 panel views

Figure 1 MSR20-10 front panel



(1) Power switch	(2) Power receptacle	(3) USB port
(4) Reset button		

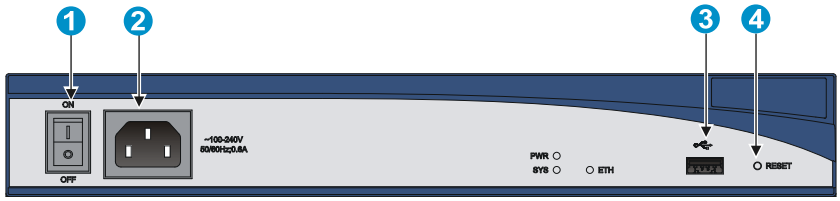
Figure 2 MSR20-10 rear panel



(1) Grounding screw	(2) Console/AUX port	(3) SIC/DSIC slot
(4) Ethernet LAN ports (ETH1 to ETH4)	(5) Ethernet WAN port ETH0	

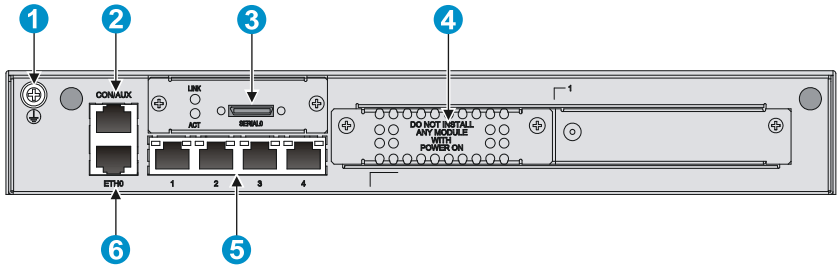
MSR20-11 panel views

Figure 3 MSR20-11 front panel



(1) Power switch	(2) Power receptacle	(3) USB port
(4) Reset button		

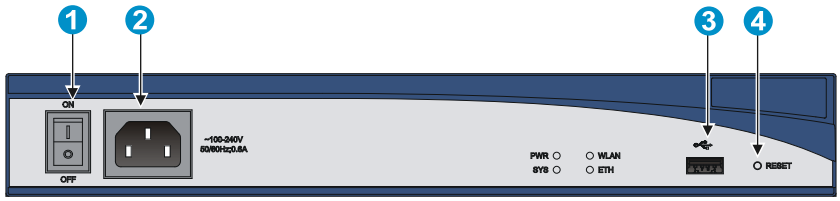
Figure 4 MSR20-11 rear panel



(1) Grounding screw	(2) Console/AUX port	(3) Synchronous/asynchronous serial port Serial 0
(4) SIC/DSIC slot	(5) Ethernet LAN ports (ETH1 to ETH4)	(6) Ethernet WAN port ETH0

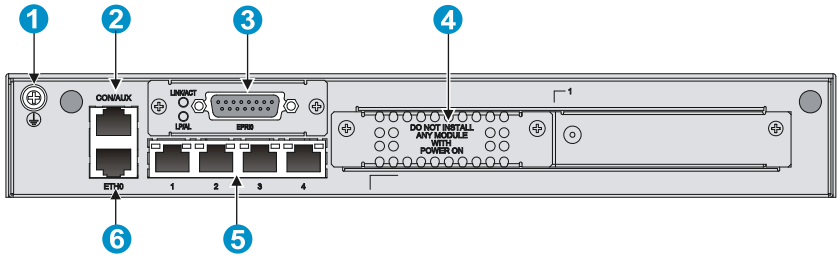
MSR20-12 panel views

Figure 5 MSR20-12 front panel



(1) Power switch	(2) Power receptacle	(3) USB port
(4) Reset button		

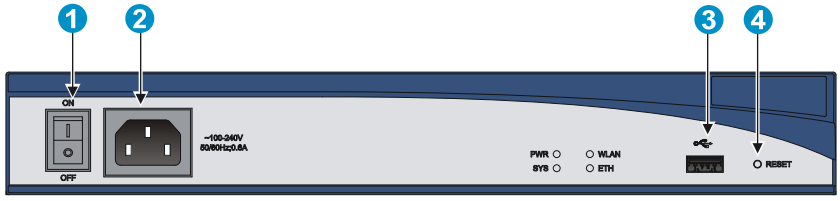
Figure 6 MSR20-12 rear panel



(1) Grounding screw	(2) Console/AUX port	(3) E1 port EPRI0
(4) SIC/DSIC slot	(5) Ethernet LAN ports (ETH1 to ETH4)	(6) Ethernet WAN port ETH0

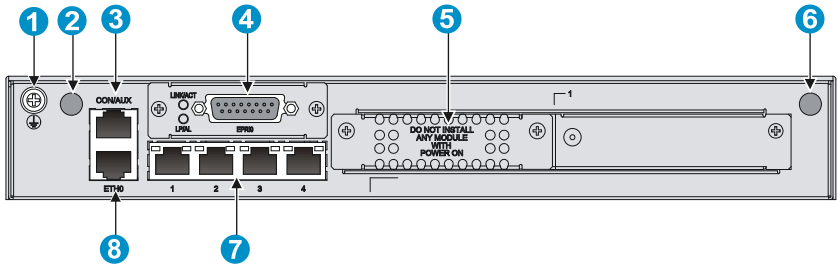
MSR20-12-W panel views

Figure 7 MSR20-12-W front panel



(1) Power switch	(2) Power receptacle	(3) USB port
(4) Reset button		

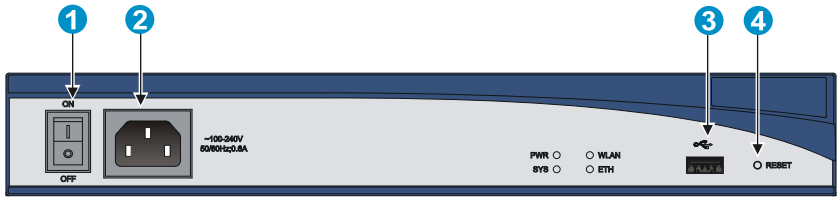
Figure 8 MSR20-12-W rear panel



(1) Grounding screw	(2) Antenna port	(3) Console/AUX port
(4) E1 port EPRI0	(5) SIC/DSIC slot	(6) Antenna port
(7) Ethernet LAN ports (ETH1 to ETH4)	(8) Ethernet WAN port ETH0	

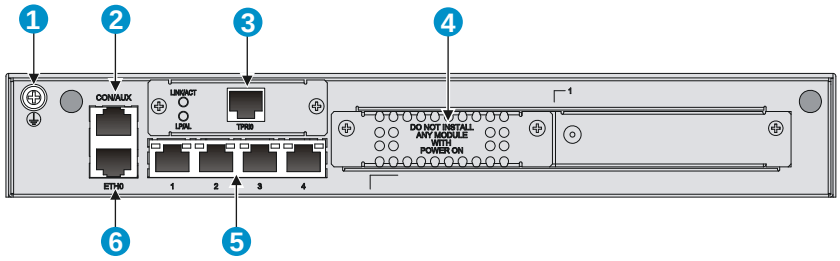
MSR20-12-T panel views

Figure 9 MSR20-12-T front panel



(1) Power switch	(2) Power receptacle	(3) USB port
(4) Reset button		

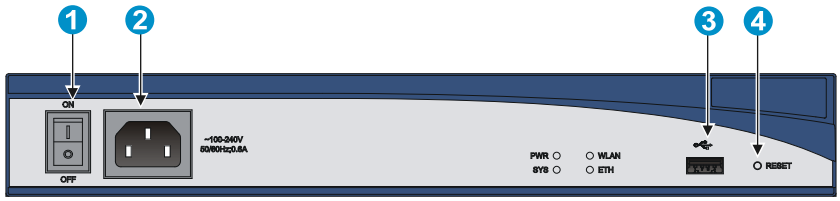
Figure 10 MSR20-12-T rear panel



(1) Grounding screw	(2) Console/AUX port	(3) T1 port TPRI0
(4) SIC/DSIC slot	(5) Ethernet LAN ports (ETH1 to ETH4)	(6) Ethernet WAN port ETH0

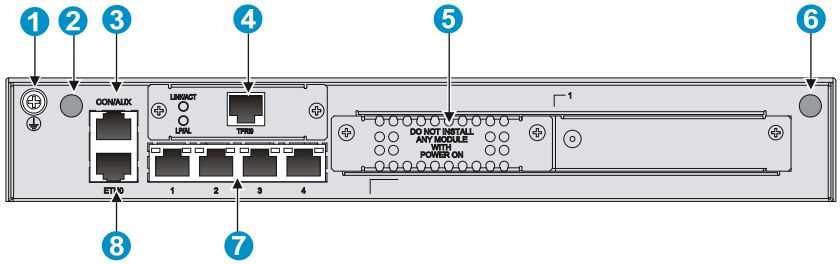
MSR20-12-T-W(NA) panel views

Figure 11 MSR20-12-T-W(NA) front panel



(1) Power switch	(2) Power receptacle	(3) USB port
(4) Reset button		

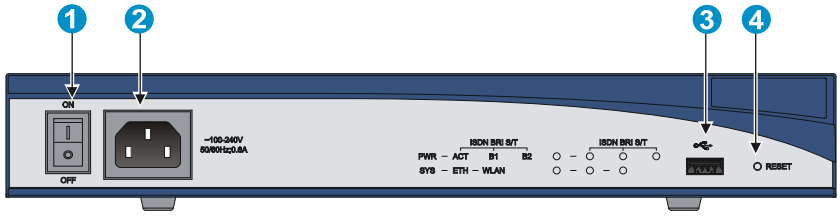
Figure 12 MSR20-12-T-W(NA) rear panel



(1) Grounding screw	(2) Antenna port	(3) Console/AUX port
(4) T1 port TPRI0	(5) SIC/DSIC slot	(6) Antenna port
(7) Ethernet LAN ports (ETH1 to ETH4)	(8) Ethernet WAN port ETH0	

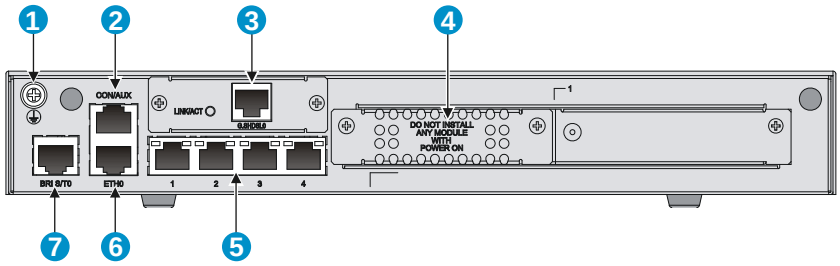
MSR20-13 panel views

Figure 13 MSR20-13 front panel



(1) Power switch	(2) Power receptacle	(3) USB port
(4) Reset button		

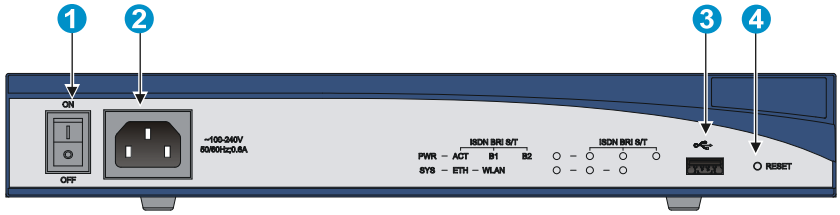
Figure 14 MSR20-13 rear panel



(1) Grounding screw	(2) Console/AUX port	(3) G.SHDSL0 port
(4) SIC/DSIC slot	(5) Ethernet LAN ports (ETH1 to ETH4)	(6) Ethernet WAN port ETH0
(7) ISDN BRI S/T0 port		

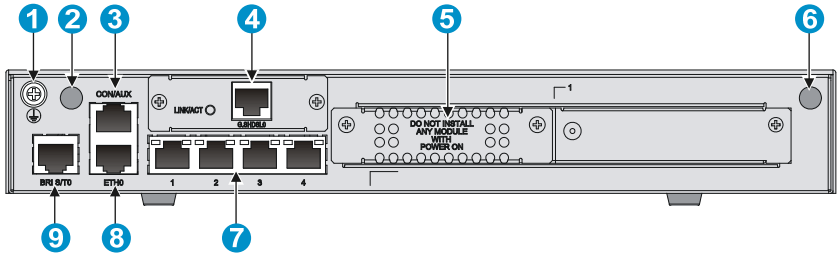
MSR20-13-W panel views

Figure 15 MSR20-13-W front panel



(1) Power switch	(2) Power receptacle	(3) USB port
(4) Reset button		

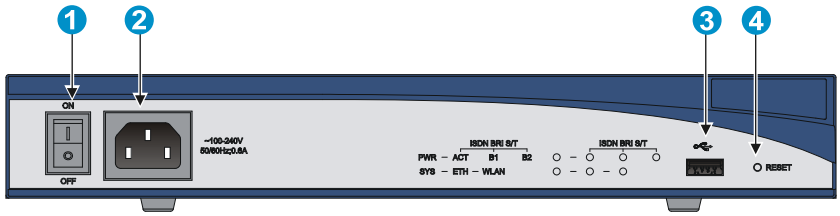
Figure 16 MSR20-13-W rear panel



(1) Grounding screw	(2) Antenna port	(3) Console/AUX port
(4) G.SHDSL0 port	(5) SIC/DSIC slot	(6) Antenna port
(7) Ethernet LAN ports (ETH1 to ETH4)	(8) Ethernet WAN port ETH0	(9) ISDN BRI S/T0 port

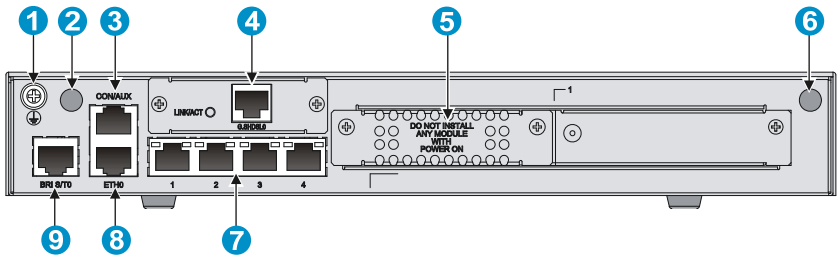
MSR20-13-W(NA) panel views

Figure 17 MSR20-13-W(NA) front panel



(1) Power switch	(2) Power receptacle	(3) USB port
(4) Reset button		

Figure 18 MSR20-13-W rear panel



(1) Grounding screw	(2) Antenna port	(3) Console/AUX port
(4) G.SHDSL0 port	(5) SIC/DSIC slot	(6) Antenna port
(7) Ethernet LAN ports (ETH1 to ETH4)	(8) Ethernet WAN port ETH0	(9) ISDN BRI S/T0 port

Preparing for installation

Safety recommendations

Safety symbols

When reading this document, note the following symbols:

⚠ WARNING means an alert that calls attention to important information that if not understood or followed can result in personal injury.

⚠ CAUTION means an alert that calls attention to important information that if not understood or followed can result in data loss, data corruption, or damage to hardware or software.

General safety recommendations

- Keep the chassis and installation tools away from walk areas.
- Make sure that the ground is dry and flat and anti-slip measures are in place.
- Unplug all the external cables (including power cables) before moving the chassis.

Safety with electricity

- Locate the emergency power-off switch in the room before installation. Shut the power off at once in case accident occurs.
- Make sure that the router has been correctly grounded.
- Do not open or close the chassis cover when the router is powered on.
- Connect the interface cables for the router correctly.
- Use an uninterrupted power supply (UPS).
- If there are two power inputs, disconnect the two power inputs to power off the router.
- Do not work alone when the router has power.
- Always check that the power has been disconnected.

Examining the installation site

The HP MSR20-1X router can only be used indoors. To ensure that the router works properly and to prolong its service lifetime, the installation site must meet the following requirements:

- Temperature and humidity
- Cleanness
- Cooling system
- ESD prevention
- EMI
- Lightning protection

- Rack-mounting

Temperature and humidity

You must maintain a proper temperature and humidity in the equipment room. Long-term high humidity may lead to bad insulation, electricity leakage, mechanical property changes, and metal corrosion. However, if the relative humidity is too low, captive screws may become loose as the result of contraction of insulation washers and static electricity may be produced in a dry environment to jeopardize the circuits on the device. A high temperature is the most undesirable condition, because it accelerates the aging of insulation materials and significantly lowers reliability and service life of the router.

For the temperature and humidity requirements of the router, see Table 1.

Table 1 Temperature/humidity requirements

Temperature	Relative humidity
0°C to 40°C (32°F to 104°F)	5% to 90%

Cleanness

Dust buildup on the chassis may result in electrostatic adsorption, which causes poor contact of metal components and contact points, especially when indoor relative humidity is low. In the worst case, electrostatic adsorption can cause communication failure.

Table 2 Dust concentration limit in the equipment room

Substance	Concentration limit (particles/cu m)
Dust particles	≤ 3×10^4 (No visible dust on desk in three days)
NOTE: Dust particle diameter ≥ 5 μm	

The equipment room must also meet strict limits on salts, acids, and sulfides to eliminate corrosion and premature aging of components, as shown in Table 3.

Table 3 Harmful gas limits in an equipment room

Gas	Max. (mg/m³)
SO_2	0.2
H_2S	0.006
NH_3	0.05
Cl_2	0.01

Cooling system

- Make sure there is enough space (greater than 10 cm (3.94 in)) around the air intake and outlet vents on the router for good ventilation.
- Make sure the installation site has a good cooling system.

ESD prevention

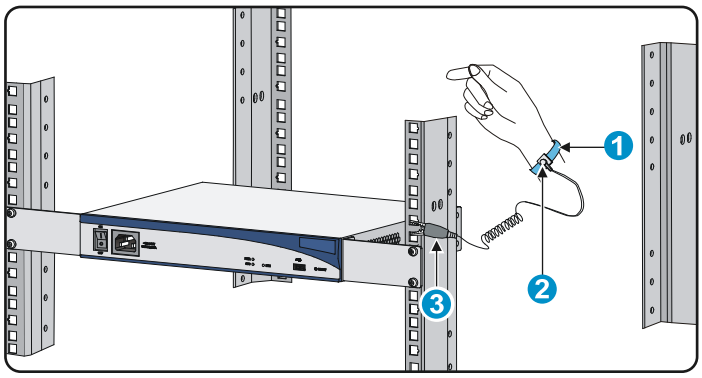
To prevent electrostatic discharge (ESD), note the following guidelines:

- Make sure that the router and the floor are well grounded.
- Take dust-proof measures for the equipment room.
- Maintain the humidity and temperature at a proper level.
- Always wear an ESD-preventive wrist strap when touching a circuit board or transceiver module.

To use the ESD-preventive wrist strap:

1. Wear the wrist strap on your wrist.
2. Lock the wrist strap tight around your wrist to keep good contact with the skin.
3. Insert the ESD-preventive wrist strap into the specially designed hole on the router chassis or attach it to the grounding screw of the chassis with the alligator clips.
4. Make sure that the rack is well grounded.

Figure 19 Use an ESD-preventive wrist strap



(1) ESD-preventive wrist strap	(2) Lock	(3) Alligator clip

CAUTION:

- Check the resistance of the ESD-preventive wrist strap for safety. The resistance reading should be in the range of 1 to 10 megohm (Mohm) between human body and the ground.
- No ESD-preventive wrist strap is provided with the HP MSR20-1X router. Prepare it yourself.

EMI

All electromagnetic interference (EMI) sources, from outside or inside of the router and application system, adversely affect the router in a conduction pattern of capacitance coupling, inductance coupling, electromagnetic wave radiation, or common impedance (including grounding system) coupling. To prevent EMI, perform the following steps:

- Take measures against interference from the power grid.
- Do not use the router together with the grounding equipment or light-prevention equipment of power equipment, and keep the router far away from them.
- Keep the router far away from high-power radio launchers, radars, and equipment with high frequency or high current.

NOTE:

Use electromagnetic shielding when necessary.

Lightning protection

To protect the router from lightning better, do as follows:

- Make sure the grounding cable of the chassis is well grounded.
- Make sure the grounding terminal of the AC power receptacle is well grounded.
- Install a lightning arrester at the input end of the power supply to enhance the lightning protection capability of the power supply.
- Install a special lightning arrester at the input end of outdoor signal lines (for example, E1/T1 line) to which interface modules of the router are connected to enhance the lightning protection capability.

Rack-mounting

Before mounting the router in a standard 19-inch rack, adhere to the following requirements:

- The rack has a good ventilation system.
- The rack is sturdy enough to support the router and installation accessories.
- Make sure that the size of the rack is appropriate for the router, and that there is enough clearance around the left and right sides of the router for heat dissipation.
- For heat dissipation and device maintenance, make sure the front and rear of the rack should be at least 0.8 m (2.62 ft) away from walls or other devices, and that the headroom in the equipment room should be no less than 3 m (9.84 ft).

Installation tools

Accessories supplied by the router

- Power cable
- Console cable
- Grounding cable

User-supplied tools and equipment

- Cross-head screwdriver P1 – 100 mm, P2 – 150 mm and P3 – 250 mm
- Plain screwdriver P4 – 75 mm
- Screws with different specifications
- Meters and equipment such as HUB, terminal, and multimeter
- ESD-preventive gloves, ESD-preventive wrist strap, ESD-preventive bag or mat
- Electric drill
- Hammer

Checklist before installation

Table 4 Checklist before installation

Item		Requirements	Result
Installation site	Ventilation	• There is a minimum clearance of 10 cm (3.9 in) around the inlet and exhaust vents for heat dissipation of the router chassis. • A ventilation system is available at the installation site.	
	Temperature	0°C to 40°C (32°F to 104°F)	
	Relative humidity	5% to 90% (noncondensing)	
	Cleanness	Dust concentration ≤ 3×10^4 particles/m^3	
	ESD prevention	• The equipment and floor are well grounded. • The equipment room is dust-proof. • The humidity and temperature are at a proper level, respectively. • Wear an ESD-preventive wrist strap and uniform when touching a circuit board.	
	EMI prevention	• Take effective measures to protect the power system from the power grid system. • Separate the protection ground of the router from the grounding device or lightning protection grounding device as far as possible. • Keep the router far away from radio stations, radar and high-frequency devices working in high current. • Use electromagnetic shielding when necessary.	
	Lightning protection	• The grounding cable of the chassis is well grounded. • The grounding terminal of the AC power receptacle is well grounded. • A port lightning arrester is installed. (Optional) • A power lightning arrester is installed. (Optional) • A signal lightning arrester is installed at the input end of an external signal cable. (Optional)	
	Electricity safety	• Equip an uninterrupted power supply (UPS). • In case of emergency during operation, switch off the external power switch.	
	Workbench	• The workbench is stable enough • Well grounding	
	Rack-mounting requirements	• Install the router in an open rack if possible. If you install the router in a closed cabinet, make sure that the cabinet is equipped with a good ventilation system. • The rack is sturdy enough to support the weight of the router and installation accessories. • The size of the cabinet is appropriate for the router. • The front and rear of the cabinet are at least 0.8 m (31.50 in) away from walls or other devices.	

Item	Requirements	Result
Safety precautions	• The router is far away from any moist area and heat source. • The emergency power switch in the equipment room is located.	
Tools	• Installation accessories supplied with the router • User supplied tools	
Reference	• Documents shipped with the router • Online documents	

Installing the router

⚠ WARNING!

To avoid bodily injury, do not touch any naked wires and terminals, and parts with a high-voltage hazard sign.

NOTE:

- The barcode stuck on the router chassis contains information about production and servicing. Before you return a faulty router for serving, please provide the barcode information of the router to your local sales agent.
- An HP tamper-proof label is stuck on a mounting screw on the router chassis. The local sales agent requires intactness of the tamper-proof label when maintaining the router. Therefore, before you open the chassis cover, please contact your local sales agent to ask for permission or follow the instruction as provided by the agent; otherwise, the user takes full responsibility for own operation if any maintenance failure occurs.

Check before installation

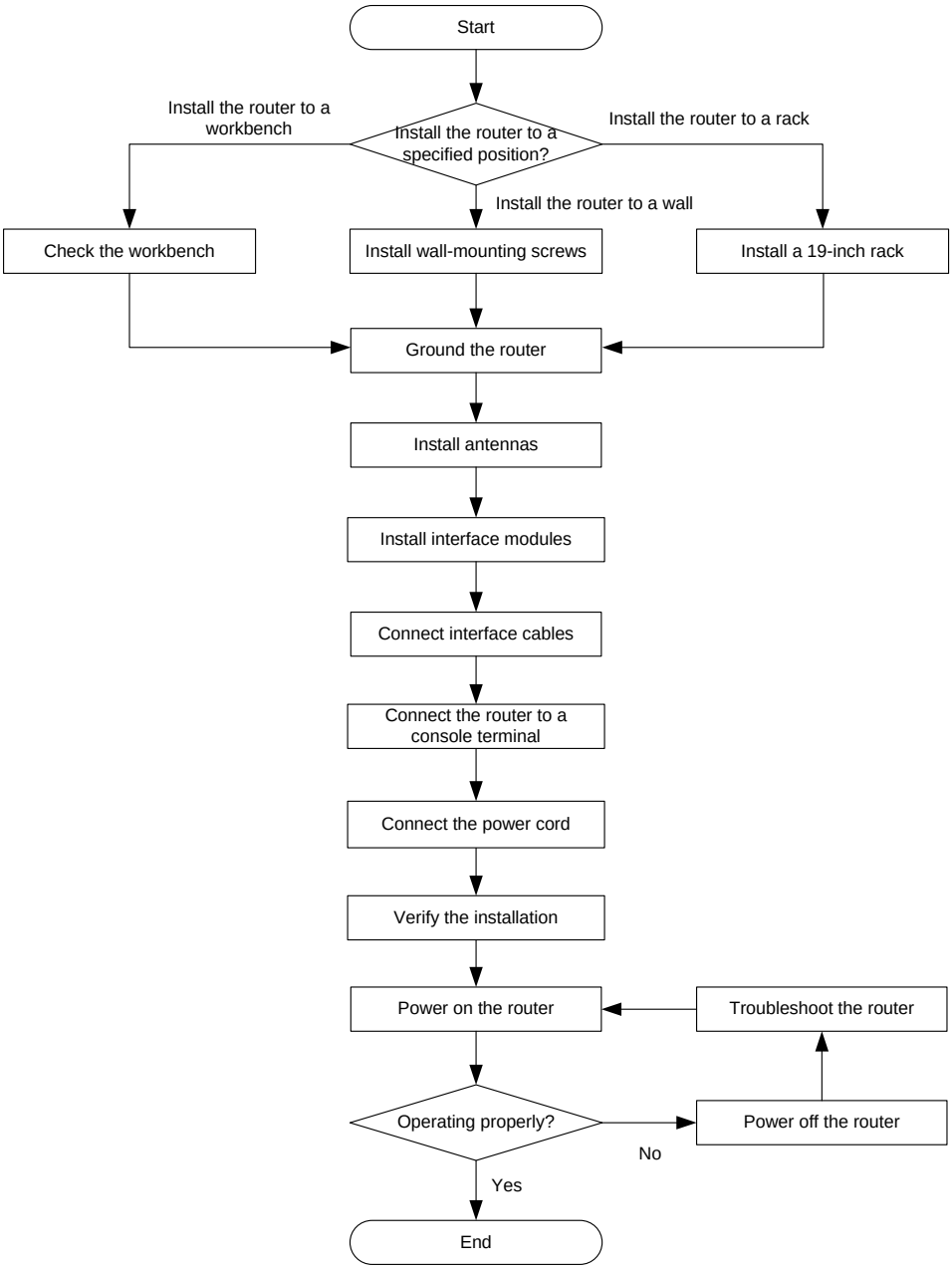
- You have read through the chapter “Preparing for installation” carefully.
- All requirements in the chapter “Preparing for installation” are satisfied.

Installation flow

You can select one of the following installation methods, and follow the installation procedures shown in Figure 20 to install your router.

- Install the router to a workbench
- Install the router to a wall
- Install the router to a 19-inch rack

Figure 20 MSR20-1X router installation flow



Installing the router

Installing the router to a workbench

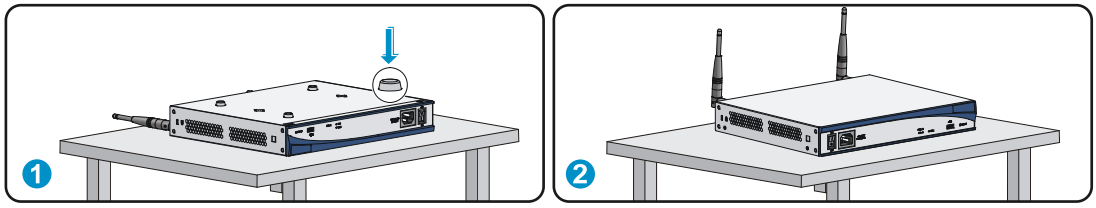
You can install the MSR20-1X router to a clean workbench. When installing the router, follow these guidelines:

- Make sure that the workbench is stable and well grounded.
- Reserve a space of 10 cm (3.9 in) around the router for heat dissipation.
- Do not place heavy objects on the router.

To install the router to a workbench:

1. Place the router up-side down on the workbench, and attach the rubber feet to the four round holes in the chassis bottom.
2. Place the router top-side up on the workbench.

Figure 21 Install the router to a workbench



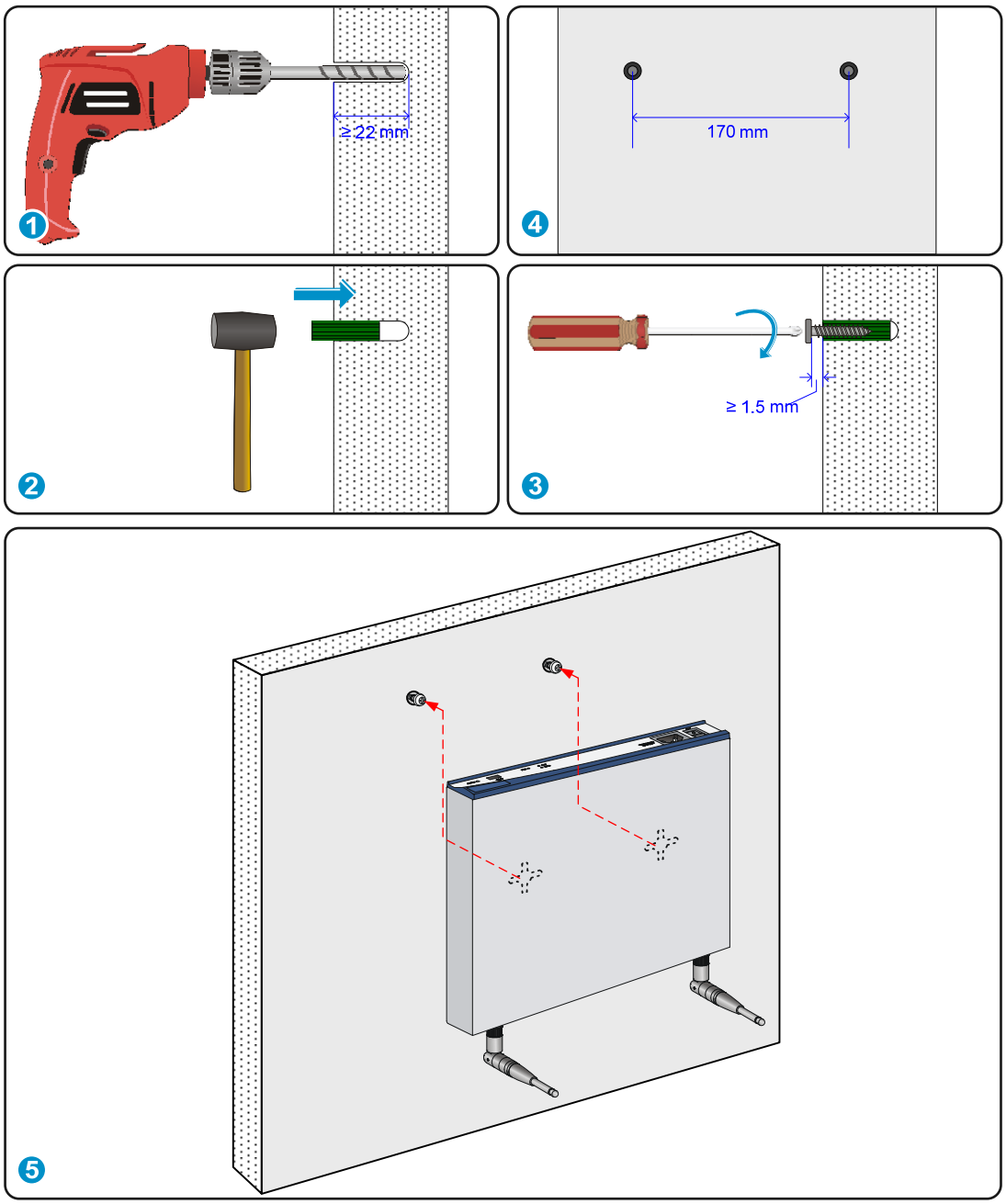
Installing the router on a wall

To install the router to a wall:

1. Mark the locations of the two mounting holes on the wall.
2. Drill two holes in the wall.

   Drill each hole at least 22 mm (0.87 in) deep, and make sure the two holes are on the same horizontal line and 170 mm (6.69 in) apart.
3. Insert an anchor into each hole until it is all flush with the wall surface.
4. Drive the screws into the anchors, keeping the screws at least 1.5 mm (0.06 in) outside the wall.
5. Hang the router on the screws.

Figure 22 Wall-mounting



CAUTION:

When mounting the router, keep the network interface facing downwards and the two sides with ventilation holes vertical to the ground.

Installing the router to a 19-inch rack

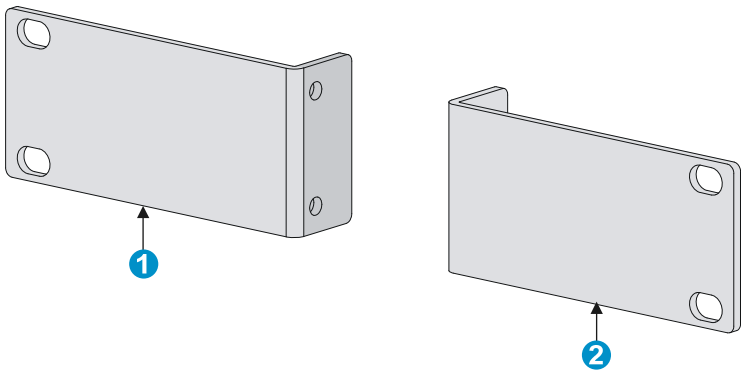
NOTE:

The MSR20-1X router does not provide mounting brackets. To install the router to a rack, order mounting brackets.

To install the router to a 19-inch rack:

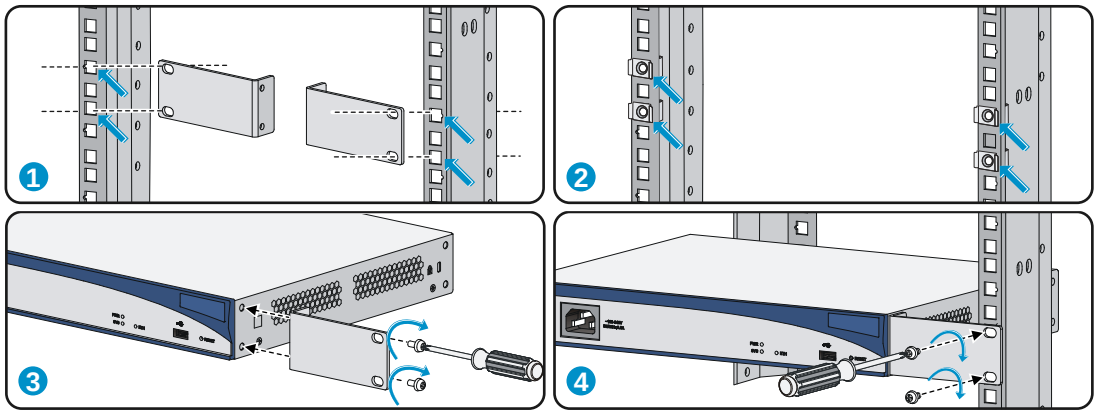
1. Determine where to install the cage nuts according to the hole distances of the mounting brackets.
2. Install cage nuts to the rack posts.
3. Attach the front left and right mounting brackets to the router.
4. Fix the router horizontally by fastening the mounting brackets to the rack with appropriate pan head screws. The specifications of pan head screws must satisfy the installation requirements, and rustproof treatment has been made to their surfaces.

Figure 23 MSR20-1X mounting brackets



(1) Left front mounting bracket	(2) Right front mounting bracket

Figure 24 Fix the router to the rack



⚠ WARNING!

Mounting brackets support only the weight of the router. To avoid damage to the router, do not place any objects on the router.

Grounding the router

⚠ WARNING!

- Correctly connecting the router grounding cable is crucial to lightning protection and EMI protection.
- The grounding resistance should be less than 5 ohms. If the router is installed in a 19-inch standard rack, the rack must also be well grounded.

You can ground the router in one of the following ways, depending on the grounding conditions available at the installation site:

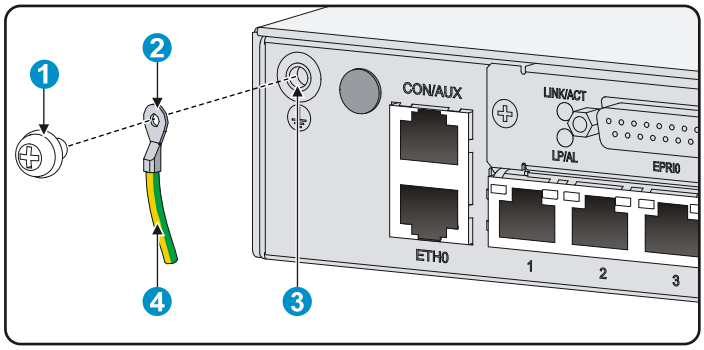
- Grounding the router with a grounding strip
- Grounding the router with a grounding conductor buried in the earth ground

Grounding the router with a grounding strip

To connect the grounding cable:

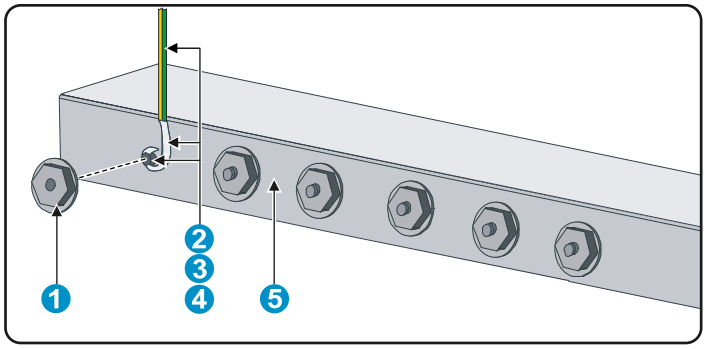
1. Remove the grounding screw from the rear panel of the router chassis.
2. Put the supplied OT terminal of the grounding cable on the grounding screw.
3. Fasten the grounding screw, which is attached with the OT terminal of the grounding cable, into the grounding screw hole with a screwdriver.
4. Attach the other end of the grounding cable to the grounding strip or grounding hole in the chassis.

Figure 25 Protection grounding terminal of the router



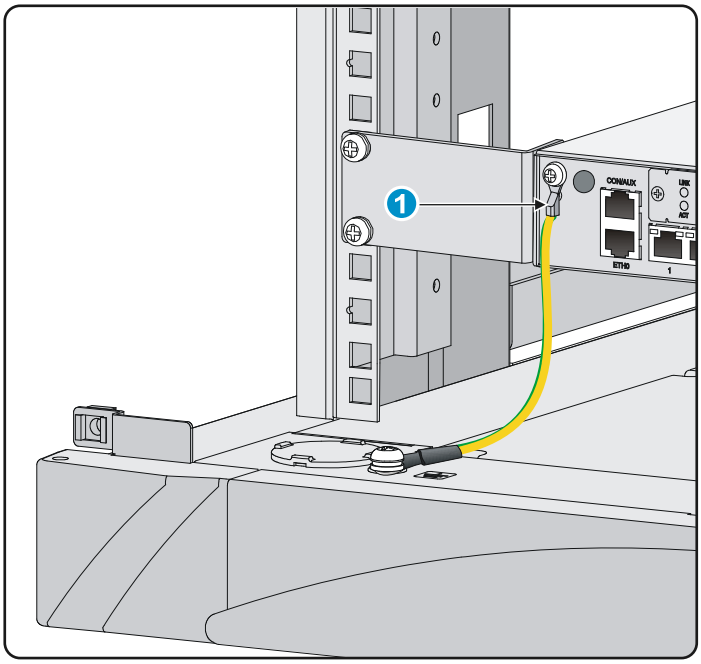
(1) Grounding screw	(2) OT terminal
(3) Grounding hole	(4) Grounding cable

Figure 26 Connect the grounding cable to a grounding strip



(1) Hex nut	(2) Grounding cable
(3) Naked metal part	(4) Grounding post
(5) Grounding strip	

Figure 27 Connect the grounding cable to the chassis

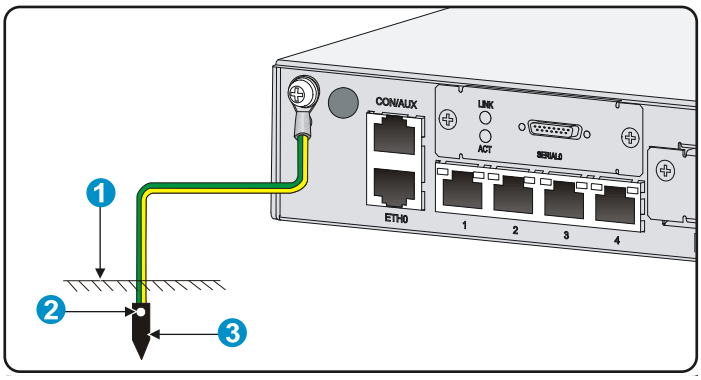


(1) OT terminal

Grounding the router with a grounding conductor buried in the earth ground

If the installation site has no grounding strips, but earth ground is available, hammer a 0.5 m (1.64 ft) or longer angle iron or steel tube into the earth ground to serve as a grounding conductor.

Figure 28 Ground the switch by burying the grounding conductor into the earth ground



(1) Earth (2) Joint (3) Angle iron

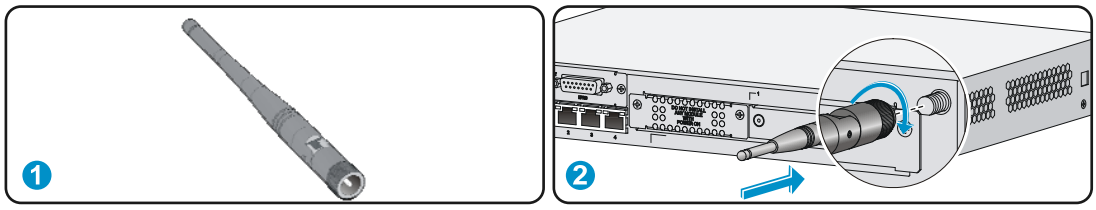
Installing an antenna

To install an antenna:

1. Adjust the angle of the antenna to 180°.
2. Fasten the antenna onto the router.

   Avoid over-tightening. The antenna must be vertical to the ground or ceiling to achieve the optimal coverage.

Figure 29 Install an antenna



CAUTION:

- Do not touch the antenna top, especially after the antenna is connected with the grounding contact. Otherwise electrostatic discharge (ESD) may damage the router.
- To ensure signal quality, use antennae supplied with the router.

Installing interface modules

Installing a SIC interface module

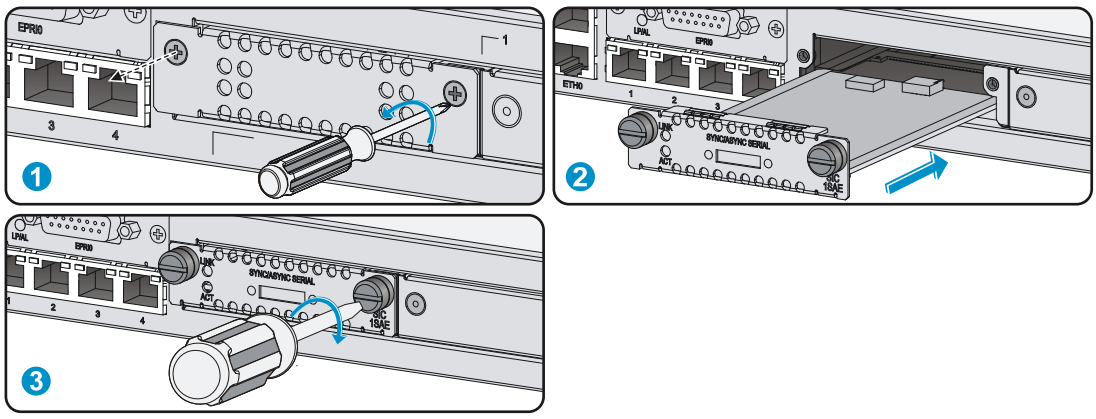
CAUTION:

Before installing an interface module, make sure the router is powered off. If not, power off the router.

To install a SIC interface module:

1. Remove the screws of the filler panel by using a Phillips screwdriver, and then remove the filler panel.
2. Push the SIC interface module into the SIC slot along the slide rails until it closely mates with the rear panel of the router.
3. Use a flat-blade screwdriver to fasten the captive screws to fix the SIC interface module to the router.

Figure 30 Install the SIC interface module



Installing a DSIC interface module

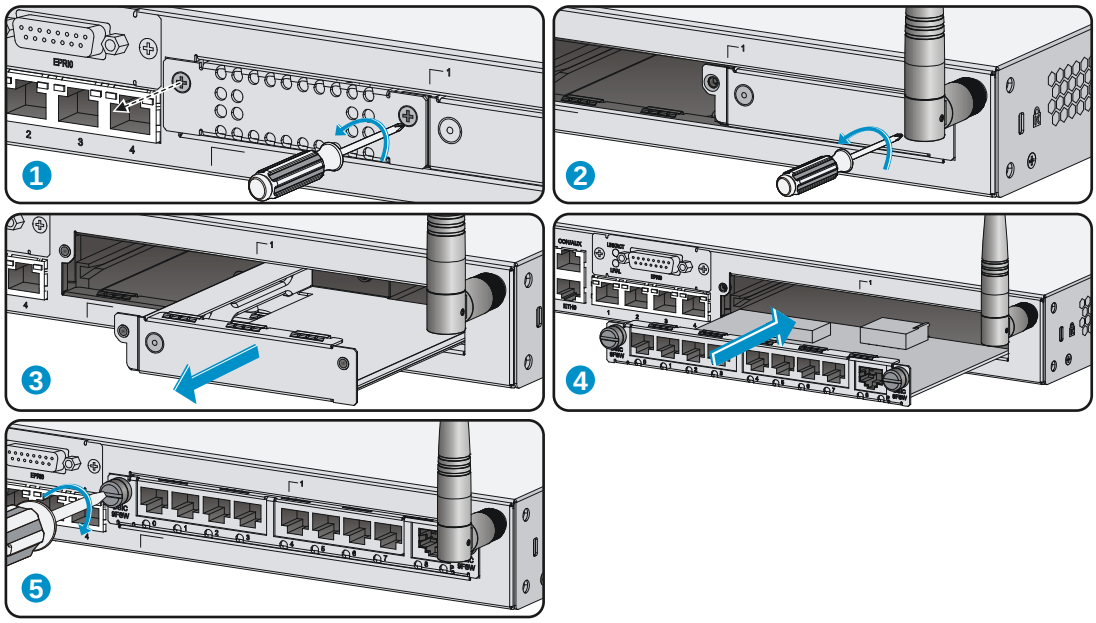
CAUTION:

Before installing an interface module, make sure the router is powered off. If not, power off the router.

To install a DSIC interface module:

1. Remove the screws on the two horizontal neighboring SIC filler panels and the slot divider by using a Phillips screwdriver.
2. Draw out the slot divider.
3. Push the DSIC interface module into the DSIC slot along the guide rails until it closely mates with the rear panel of the router.
4. Use a flat-blade screwdriver to fasten the captive screws to fix the DSIC interface module to the router.

Figure 31 Install a DSIC interface module



Connecting interface cables

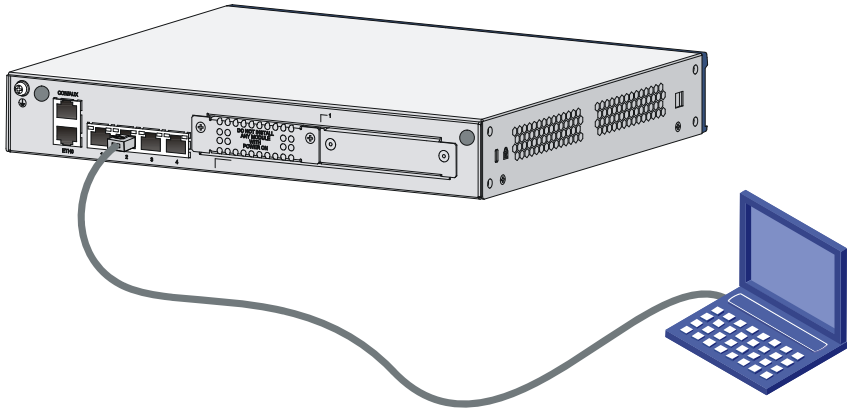
Before powering on the router, connect the interface cables of the router.

Connecting an Ethernet cable

To connect a copper Ethernet port, connect one end of the Ethernet cable to an Ethernet port on the router and the other end to the peer device. For a 10/100 Mbps copper Ethernet port that supports MDI/MDIX autosensing, use a straight-through cable or crossover cable to connect the port to a hub or LAN switch.

Figure 32 Connect an Ethernet cable to a WAN port

Figure 33 Connect an Ethernet cable to a LAN port



Connecting a synchronous/asynchronous serial interface cable

The MSR20-11 uses a synchronous/asynchronous serial interface cable with DB-28 connectors for connection.

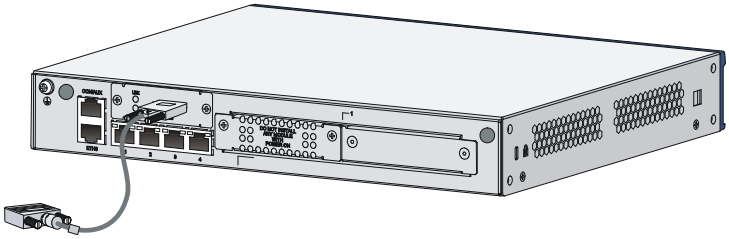
Before connecting to a port on the MSR20-11, confirm the line properties of the interface to select an appropriate cable from the following cable options:

- V.24 (RS232) DTE cable: DB-25 (male) connector at the network end
- V.24 (RS232) DCE cable: DB-25 (female) connector at the network end
- V.35 DTE cable: 34PIN (male) connector at the network end
- V.35 DCE cable: 34PIN (female) connector at the network end
- X.21 DTE cable: DB-15 (male) connector at the network end
- X.21 DCE cable: DB-15 (female) connector at the network end
- RS449 DTE cable: DB-37 (male) connector at the network end
- RS449 DCE cable: DB-37 (female) connector at the network end
- RS530 DTE cable: DB-25 (male) connector at the network end
- RS530 DCE cable: DB-25 (female) connector at the network end

To connect a serial interface cable:

1. Select a synchronous/asynchronous serial interface cable depending on the type of the interface on the remote device.
2. Connect the DB-28 connector of the cable to the DB-28 port on the router.
3. Connect the other end of the cable to the remote device.

Figure 34 Connect a serial interface cable



Connecting an E1 interface cable

The E1 interface cables for the MSR20-12 are E1 G.703-compliant 75-ohm unbalanced coaxial cables. A 75-ohm unbalanced coaxial cable connects MSR20-12 with the DB-15 connector and the network end with the BNC connector.

To connect an E1 interface cable:

1. Connect the DB-15 connector of the E1 cable to the E1 port on the router.
2. Connect the other end of the E1 cable to the corresponding network device:
   - Directly connect the BNC connectors of the cable to the remote equipment if there is no need for extension.
   - Connect the BNC connectors of the cable to coaxial connectors and the other end of the coaxial connectors to the remote network equipment through 75-ohm E1 trunk cables, if cable extension is needed.

CAUTION:

Connect the wire marked TX in the E1 cable to the peer wire marked RX and the wire marked RX to the peer wire marked TX.

Figure 35 Connect an E1 interface cable

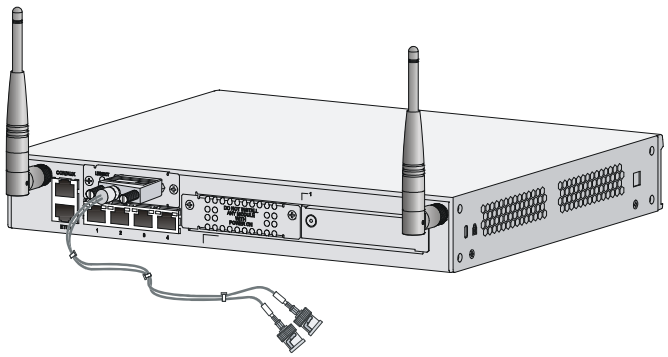
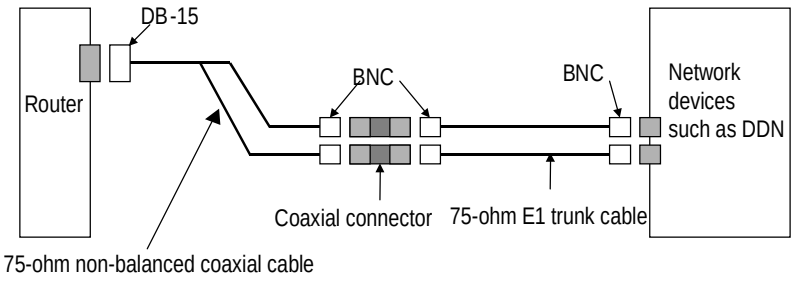


Figure 36 Extending an E1 75-ohm unbalanced coaxial cable



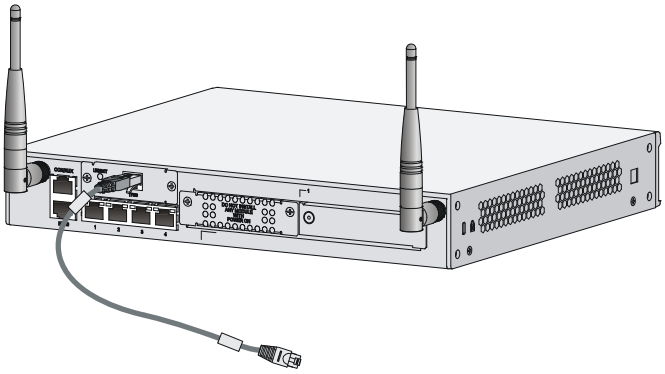
Connecting a T1 interface cable

An MSR20-12 T1 interface cable is a 100-ohm standard shielded Ethernet cable that has RJ-45 connectors at both ends.

To connect a T1 interface cable:

1. Connect one end of the T1 cable to the RJ-45 connector on the T1 port of the router.
2. Connect the other end of the T1 cable to the corresponding device.

Figure 37 Connect a T1 interface cable



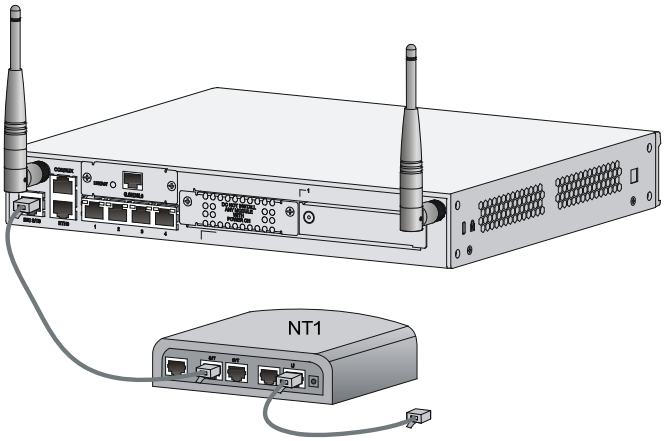
Connecting an ISDN BRI S/T interface cable

An MSR20-13 ISDN BRI S/T interface cable is a standard Ethernet cable that has RJ-45 connectors at both ends.

To connect an ISDN BRI S/T interface cable:

1. If the line is an ISDN U-interface line, use an NT1 for conversion. Connect one end of the Ethernet cable to the ISDN BRI S/T interface, and the other end to the S/T interface on NT1.
2. If the line is an ISDN S/T interface line, connect one end of the Ethernet cable to the ISDN BRI S/T interface, and the other end with the ISDN S/T interface line.

Figure 38 Connect an ISDN BRI S/T interface cable

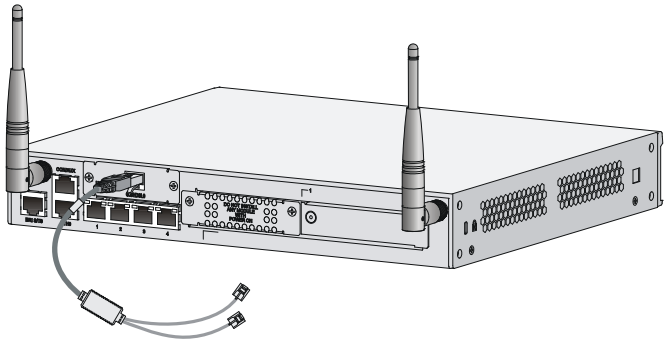


Connecting a G.SHDSL interface cable

An MSR20-13 G.SHDSL interface cable is a telephone cable with ferrite core (one RJ-45 connector to two RJ-11 connectors).

To connect a G.SHDSL interface cable, connect the RJ-45 connector to the G.SHDSL interface and the other end to the remote network device.

Figure 39 Connect a G.SHDSL interface cable



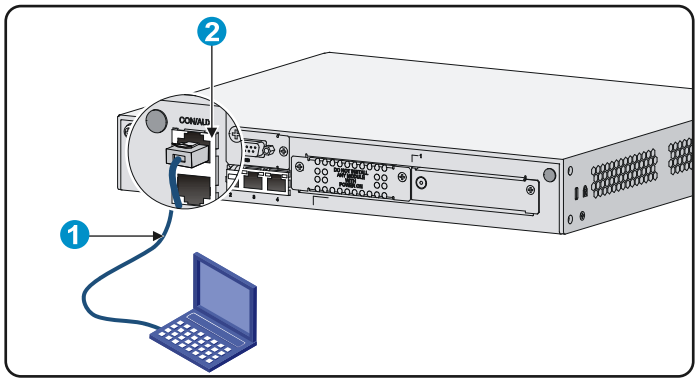
Connecting the console cable and setting terminal parameters

Connecting the console cable

To connect the console cable:

1. Select a console terminal, which can be an ASCII terminal with an RS232 serial port or a PC. A PC is more commonly used.
2. Connect the DB-9 connector (female) of the console cable to the RS-232 serial port of the console terminal and the RJ-45 connector to the console port of the router.

Figure 40 Connect the console cable



(1) Console cable	(2) Console port (CONSOLE)

CAUTION:

When connecting the PC to the router by using a console cable, connect the DB-9 end of the console cable to the serial port of the PC first, and then connect the RJ-45 connector of the console cable to the console port of the router.

Setting console terminal parameters

To set console terminal parameters:

1. Select **Start** > **All Programs** > **Accessories** > **Communications** > **HyperTerminal**, and in the **Connection Description** dialog box that appears, enter the name of the new connection in the **Name** field and click **OK**.

Figure 41 The Connection Description interface of HyperTerminal

2. Select the serial port to be used from the **Connect using** list, and click **OK**.

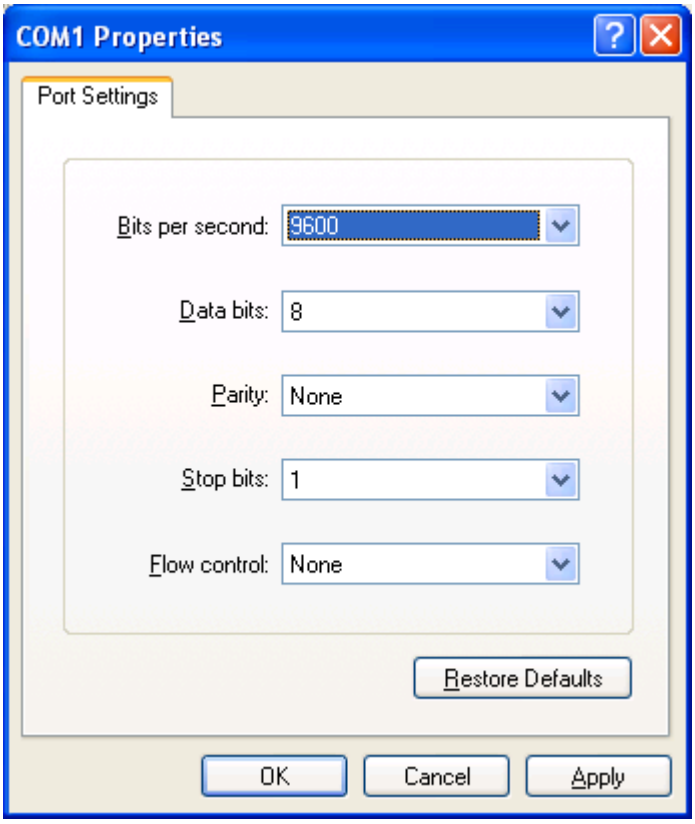
Figure 42 Select a port for the HyperTerminal connection

3. Set **Bits per second** to **9600**, **Data bits** to **8**, **Parity** to **None**, **Stop bits** to **1**, and **Flow control** to **None**, and click **OK**.

NOTE:

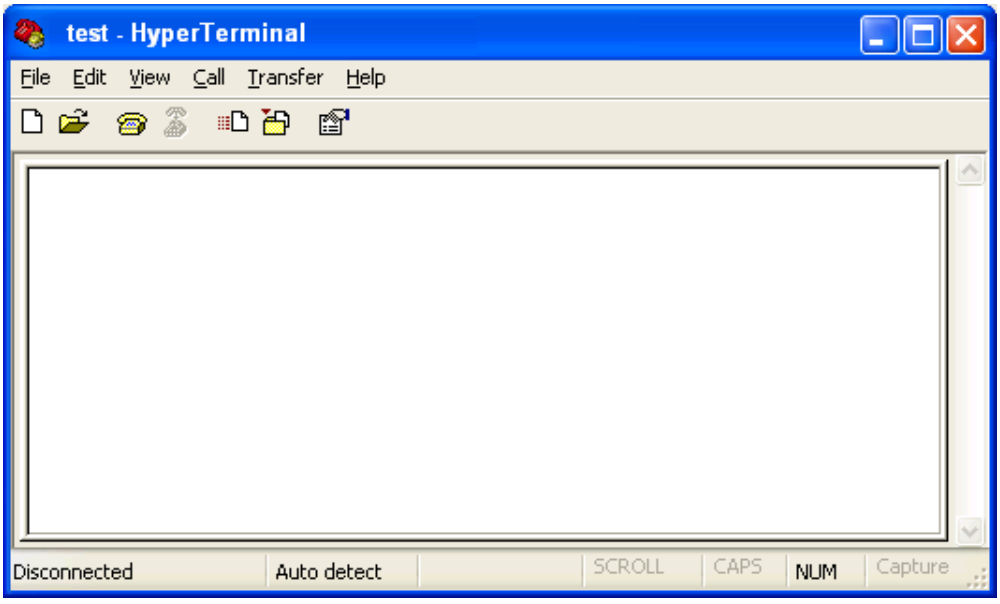
To restore the default settings, click **Restore Defaults**.

Figure 43 Set serial port parameters



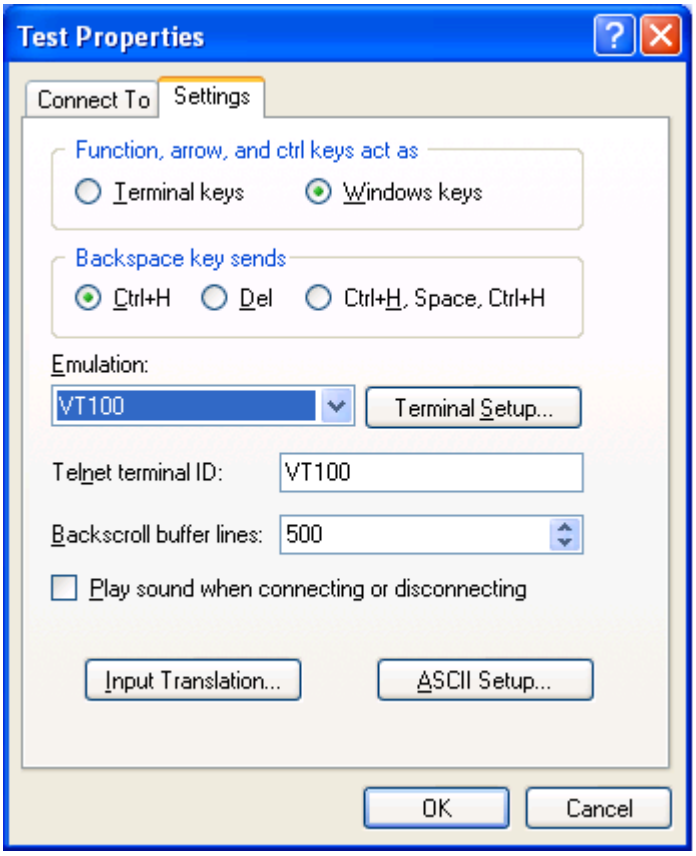
4. Select **File** > **Properties** in the HyperTerminal window.

Figure 44 HyperTerminal window



5. Click the **Settings** tab, set the emulation to **VT100** or **Auto Detect** and click **OK** in the **Test Properties** dialog box.

Figure 45 Set the terminal emulation parameters

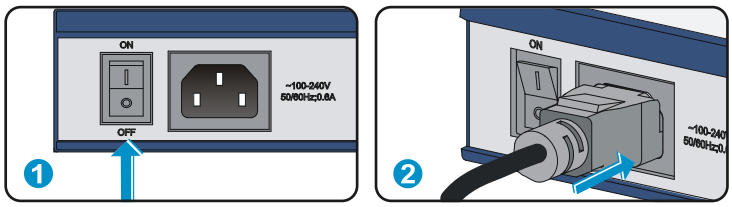


Connecting an AC power cord

To connect the AC power cord:

1. Make sure the router is well grounded and the power switch of the router is in the OFF position.
2. Connect one end of the power cord shipped with the router to the power socket on the rear panel, and the other end to an AC power source.

Figure 46 Connect the AC power cord



Verifying the installation

After installation, verify the following items before powering on the router:

- Enough space is reserved around the router for heat dissipation, and the router is sturdy.
- Antennae, USB devices, and interface modules are correctly installed.
- The router, rack, and power module are well grounded.

- The power supply is as required.
- The router is correctly connected to the console terminal and other devices. Parameters are correctly configured on the console terminal.

CAUTION:

The check after installation is very important. The stability, grounding of the router, and power supply can affect the operation of the router.

Starting up and configuring the router

Before starting up the router, you must set up the configuration environment. After that, you can power on the router and perform initial configuration for the router.

Powering on the router

- Switch on the power source
- Turn on the power switch on the router

WARNING!

Before powering on the router, locate the power switch of the power source so that you can disconnect the power supply in time in case of an emergency.

Startup process

After power-on, the router initializes its memory, and then runs the extended BootWare. The following information appears on the terminal screen:

```
System is starting...
Do you want to check SDRAM? [Y/N]
Booting Normal Extend BootWare........
The Extend BootWare is self-decompressing.....................
Done!

********************************************************************************
*                                                                              *
*                HP MSR20-10  BootWare, Version 2.24                   *
*                                                                              *
********************************************************************************
Copyright (c) 2010-2011 Hewlett-Packard Development Company, L.P.

Compiled Date       : Feb 16 2011
CPU Type            : MPC8323E
CPU L1 Cache        : 16KB
CPU Clock Speed     : 333MHz
Memory Type         : DDR SDRAM
Memory Size         : 256MB
Memory Speed        : 266MHz
BootWare Size       : 1024KB
CPLD Version        : 1.0
```

```
PCB Version         : 3.0


BootWare Validating...
Press Ctrl+B to enter extended boot menu...

Starting to get the main application file--flash0:/mainmsr201x.bin!.............
................................................................................
................................................................................
....
The main application file is self-decompressing.............................
.......
Done!
System application is starting...

User interface con0 is available.



Press ENTER to get started.
```

Press **Enter** and the system displays the following prompt:

```
<HP>
```

This prompt indicates that the router has entered user view and is ready to configure.

Power-on check

After powering on the router, check the following items:

1. The LEDs on the front panel are normal.

The following table describes normal LED status after the router is powered on.

Table 5 Normal LED status after the router is powered on

LED	Status	Meaning
PWR	Steady green	The power supply is working properly.
SYS	Flashing green slowly	The system is working properly.

2. The configuration terminal displays information correctly. You can see the startup window on the local configuration terminal. For more information, see "Startup process."
3. After the power-on self-test (POST), the system prompts you to press **Enter**. When the command line prompt appears, the router is ready to configure.

Configuring basic settings for the router

After the router is powered on for the first time, configure basic settings for the router. For more information, see *HP MSR Router Series Fundamentals Configuration Guide* and *HP MSR Router Series Fundamentals Command Reference*.

Installing and upgrading internal modules

This chapter describes how to install and upgrade internal modules.

The MSR20-1x Router Series has one type of internal module: Voice processing module (VPM)

NOTE:

- The barcode stuck on the router chassis contains information about production and servicing. Before you return a faulty router for serving, please provide the barcode information of the router to your local sales agent.
- An HP tamper-proof label is stuck on a mounting screw on the router chassis. The local sales agent requires intactness of the tamper-proof label when maintaining the router. Therefore, before you open the chassis cover, please contact your local sales agent to ask for permission or follow the instruction as provided by the agent; otherwise, the user takes full responsibility for own operation if any maintenance failure occurs.

Locating the internal modules in the router

Opening and removing the chassis cover

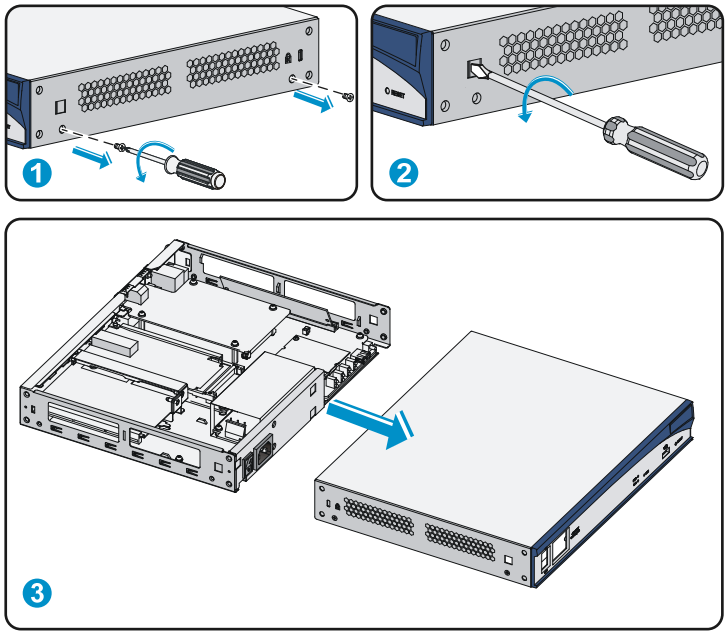
⚠ WARNING!

- To avoid bodily injuries and device damages, make sure that all power sources to the router are disconnected before maintaining any hardware modules of the router.
- When maintaining the router hardware, always wear an ESD-preventive wrist strap and ensure good skin contact.

To open the MSR20-1x router chassis cover:

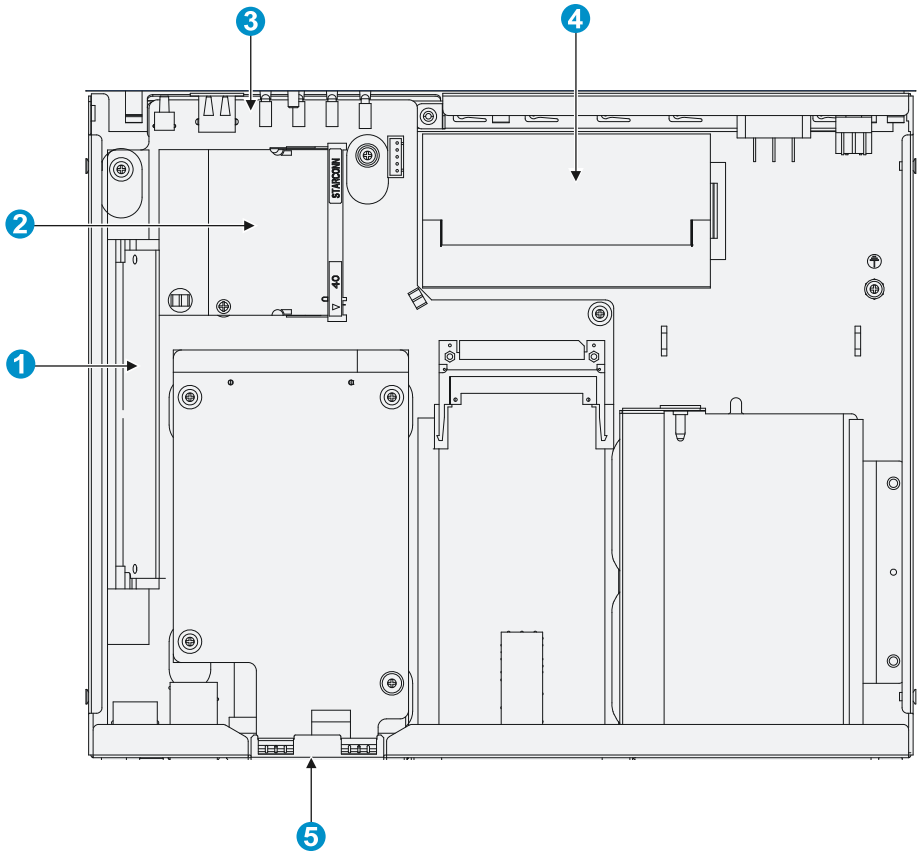
1. Make sure that the power source of the router is turned off, and the power cords and network cables have been unplugged.
2. Put the router on a flat workbench, and use a Philips screwdriver to remove the fastening screws on both sides of the router.
3. Insert a flat-blade screwdriver into the key holes on both sides of the chassis, and gently pry the cover until the cover is separated from the chassis.
4. Pull the chassis cover backward until it is completely separated from the chassis. Keep the chassis cover.

Figure 47 Remove the chassis cover



Locating the internal modules in the router

Figure 48 Internal architecture of an MSR 20-1x router



(1) VPM module	(2) Built-in WLAN module	(3) Front panel

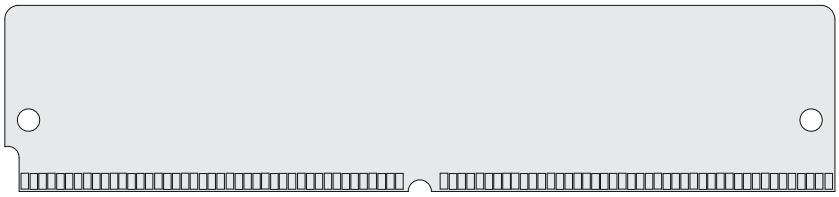
(4) Power supply	(5) Rear panel

Installing and removing a VPM module

The VPM module can perform voice traffic compression/decompression, echo cancellation (EC), and comfortable noise generation (CNG). The VPM modules fall into the following types:

- 8-channel VPM (RT-VPM8)
- 16-channel VPM (RT-VPM16)
- 24-channel VPM (RT-VPM24)
- 32-channel VPM (RT-VPM32)

Figure 49 VPM module

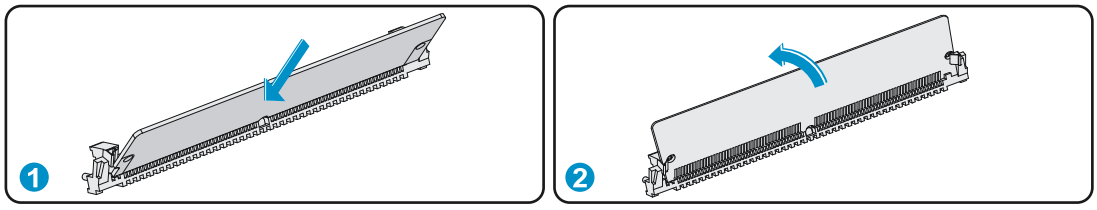


Installing a VPM module

To install a VPM module:

1. Align the golden finger of the VPM module with the VPM module slot on the motherboard of the router. Insert the VPM module into the slot at a 45-degree angle.
2. Tilt the VPM module up to the vertical position until you hear a click. This click indicates the VPM module is firmly inserted in the slot.

Figure 50 Install a VPM module

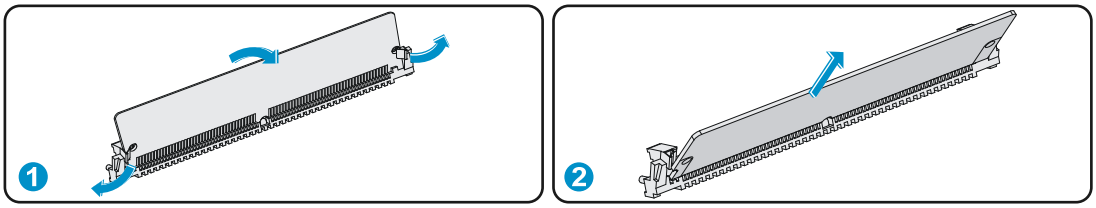


Removing a VPM module

To remove a VPM module:

1. Press down and pull the release latches away from the VPM module at both ends to separate the VPM module from the release latches.
2. Remove the VPM module, and keep the VPM module.

Figure 51 Remove a VPM module



Troubleshooting

NOTE:

- The barcode stuck on the router chassis contains information about production and servicing. Before you return a faulty router for serving, please provide the barcode information of the router to your local sales agent.
- An HP tamper-proof label is stuck on a mounting screw on the router chassis. The local sales agent requires intactness of the tamper-proof label when maintaining the router. Therefore, before you open the chassis cover, please contact your local sales agent to ask for permission or follow the instruction as provided by the agent; otherwise, the user takes full responsibility for own operation if any maintenance failure occurs.

Power supply failures

Power LED is off

If the router cannot be powered on and the power LED on the front panel is off, it indicates that the power supply is faulty.

To troubleshoot the power supply failure:

1. Power off the router.
2. Check whether the power cords of the router are firmly connected.
3. Check whether the power source is operating properly.
4. Check whether the power cord is damaged.

If the cause cannot be located in the steps above and the problem persists, contact your local sales agent.

Configuration system problems

If the configuration environment setup is correct, the configuration terminal displays boot information when the router is powered on. If the setup is incorrect, the configuration terminal displays nothing or garbled text.

No terminal display

If the configuration terminal displays nothing when the router is powered on, follow these steps to troubleshoot the failure:

1. Check the following items.
   - The power supply system works properly.
   - The console cable is properly connected.
2. If no problem is found, check the following reasons that may apply:

- The console cable is connected to an incorrect serial port (the serial port in use is not the one set on the terminal).
- The properties of the terminal are incorrect. You must configure the console terminal as follows: set **Bits per second** to **9600**, **Data bits** to **8**, **Parity** to **None**, **Stop bits** to **1**, **Flow control** to **None**, and **Terminal Emulation** to **VT100**.
- The console cable fails.

Garbled terminal display

If terminal display is garbled, make sure that the **Data bits** field is set to 8 for the console terminal. If the **Data bits** field is set to 5 or 6, the console terminal will display garbled characters.

No response from the serial port

If the serial port gives no response, check that the serial cable is in good condition and serial port settings are correct.

Password loss

User password loss

If you lose your password, you cannot enter the system. In this case, you can boot the system by ignoring the system configuration.

To solve the user password loss:

1. Enter the main BootWare menu, and select **6** to boot the system by ignoring the system configuration.

The system prompts the following:

```
Flag Set Success.
```

The output shows that the setting succeeded.

2. When the main BootWare menu appears again, and select **0** to reboot the system.

```
System is rebooting now.
System start booting...
Booting Normal Extend BootWare....
```

3. Set a new password in system view after the system reboots. The console port uses password authentication, and the password is set to **123456** and stored in plain text.

```
<HP> system-view
[HP] user-interface console 0
[HP-ui-console0] authentication-mode password
[HP-ui-console0] set authentication password simple 123456
```

When you set the password by using the **set authentication password** { **cipher** | **simple** } *password* command, follow these guidelines.

- If the **cipher** keyword is specified, the password is stored in cipher text. You cannot view the password by using the **display current-configuration** command.
- If the **simple** keyword is specified, the password is stored in plain text. You can use the **display current-configuration** command to view the password in the current configuration.

NOTE:

- After reboot, the system runs with the initial default configuration, but the original configuration file is still stored in the storage medium. To restore the original configuration, use the display saved-configuration command to display the configuration, and then copy and execute the configuration.
- If the password is stored in plain text, you can use the display current-configuration command to view the password in the current configuration. If the password 123456 is set with the set authentication password cipher command, the password is stored in cipher text.

4. Save the new password.

```
[HP] save
```

NOTE:

- To save the new password, execute the save command after modifying the user password.
- HP recommends saving the modification as the default configuration file.

Super password loss

The super password enables you to switch between four super levels. In the case of super password loss, you cannot perform higher level operations.

You can clear the super password by selecting **8** on the main BootWare menu.

```
========================<EXTEND-BOOTWARE MENU>=========================
|<1> Boot System                                                      |
|<2> Enter Serial SubMenu                                             |
|<3> Enter Ethernet SubMenu                                           |
|<4> File Control                                                     |
|<5> Modify BootWare Password                                         |
|<6> Skip Current System Configuration                                |
|<7> BootWare Operation Menu                                          |
|<8> Clear Super Password                                             |
|<9> Storage Device Operation                                         |
|<0> Reboot                                                           |
==========================================================================
Enter your choice(0-9):8
```

The following output indicates that you have successfully cleared the super password.

```
Clear Application Password Success!
```

NOTE:

- Select option 8, quit the menu, reboot the router, and then you can enter system view directly.
- This setting (password clearing) is valid only for the first reboot of the router. The super password will be restored after a second reboot.

Interface module, cable, and connection failure

After an interface module is installed and the router is powered on, the LEDs on the module panel may indicate abnormal operation.

To solve this problem:

1. Check whether the router supports the interface module.
2. Check whether the interface module is installed in the correct slot.
3. Check whether the interface cable is correctly selected.
4. Check whether the interface cable is correctly connected.

Appendix A Technical specifications

MSR20-1X specifications

Table 6 MSR20-1X specifications

Item	20-10	20-11	20-12	20-12-W	20-12-T	20-12-T-W(NA)	20-13	20-13-W	20-13-W(NA)
Console/AUX port	1								
USB port	1								
FE WAN port	1								
FE LAN port	4								
Serial port	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E1 port (75-ohm impedance by default)	N/A	N/A	1	1	N/A	N/A	N/A	N/A	N/A
T1 port	N/A	N/A	N/A	N/A	1	1	N/A	N/A	N/A
G.SHDSL.BIS (4-wire) port	N/A	N/A	N/A	N/A	N/A	N/A	1	1	1
ISDN BRI S/T port	N/A	N/A	N/A	N/A	N/A	N/A	1	1	1
SIC/DSIC slot	1 SIC or 1 DSIC								
Built-in WLAN module	N/A	N/A	N/A	802.11b/g	N/A	802.11b/g(NA)	N/A	802.11b/g	802.11b/g(NA)
VPM module slot	1	1	1	1	1	1	N/A	N/A	N/A
Memory	256 MB DDR SDRAM								
Flash	32 MB								
Dimensions (H × W × D) (excluding rubber feet and mounting brackets)	44.2 × 300 × 240 mm (1.74 × 11.81 × 9.45 in)								
Weight	3 kg (6.61 lb)								
AC power supply	Rated input voltage: 100 VAC to 240 VAC; 50 Hz or 60 Hz								
Max AC power	25 W								

Item	20-10	20-11	20-12	20-12-W	20-12-T	20-12-T-W(NA)	20-13	20-13-W	20-13-W(NA)
Operating temperature	0°C to 40°C (32°F to 104°F)								
Relative humidity (non-condensing)	5% to 90%								

NOTE:

- MSR20-12-T-W(NA) and MSR20-13-W(NA) are North American models.
- Before installing a SIC-1VE1 or SIC-1VT1 module to the MSR20-12/20-12-W/20-12-T/20-12-T-W(NA), purchase a VPM module and install it to the VPM slot on the motherboard.
- By default, the impedance of the E1 port on MSR20-12/20-12-W is 75 ohms. By using the internal DIP switches, you can change the interface impedance to 120 ohms. For more information, see the chapter "Appendix C Setting the fixed E1 port impedance."

Antenna specifications

Table 7 Antenna specifications

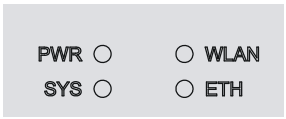
Item	Specification
Frequency range	2400 MHz to 2500 MHz
Voltage Standing Wave Ratio (VSWR)	≤2.0
Input impedance	50 ohms
Gain	2±1 dBi
Max power consumption	25 W
Input interface	Reverse-polarity SMA-J
Length	134 mm (5.28 in)
Color	Black
Weight	25 g (0.88 oz)
Operating temperature	–40°C to +60°C (–40°F to +140°F)

Appendix B LEDs and Reset button

LEDs

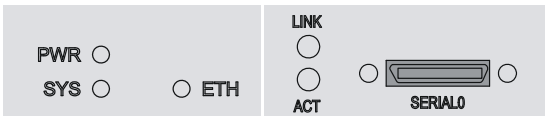
MSR20-10

Table 8 MSR20-10 LED description

LED	Location	Status	Description
			
PWR	Front panel	Solid green	The power supply is connected.
		Off	The power supply is not connected.
SYS	Front panel	Fast flashing (green)	The system is starting up.
		Slow flashing (green)	The system is operating properly.
		Fast flashing (yellow)	A problem has occurred to the system.
		Off	The system has failed to operate properly.
ETH	Front panel	Solid green	A link is present.
		Flashing green	Data is being transmitted or received on the port.
		Off	No link is present.
WLAN	Front panel	Off	No built-in WLAN module is provided with the model.

MSR20-11

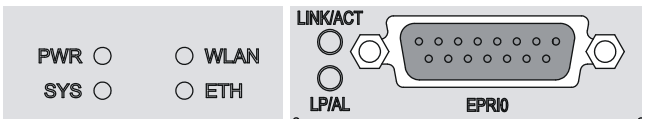
Table 9 MSR20-11 LED description

LED	Location	Status	Description
			
PWR	Front panel	Solid green	The power supply is connected.
		Off	The power supply is not connected.
SYS	Front panel	Fast flashing (green)	The system is starting up.

LED	Location	Status	Description
		Slow flashing (green)	The system is operating properly.
		Fast flashing (yellow)	A problem has occurred to the system.
		Off	The system has failed to operate properly.
ETH	Front panel	Solid green	A link is present.
		Flashing green	The interface is transmitting or receiving data.
		Off	No link is present.
WLAN	Front panel	Off	No built-in WLAN module is provided with the model.
LINK	Rear panel	Solid green	A link is present.
		Off	No link is present.
ACT	Rear panel	Flashing green	Data is being transmitted or received.
		Off	No data is being transmitted or received.

MSR20-12

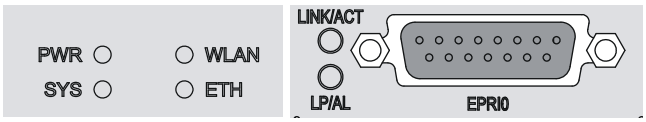
Table 10 MSR20-12 LED description

LED	Location	Status	Description
			
PWR	Front panel	Solid green	The power supply is connected.
		Off	The power supply is not connected.
SYS	Front panel	Fast flashing (green)	The system is starting up.
		Slow flashing (green)	The system is operating properly.
		Fast flashing (yellow)	A problem has occurred to the system.
		Off	The system has failed to operate properly.
ETH	Front panel	Solid green	A link is present.
		Flashing green	The port is transmitting or receiving data.
		Off	No link is present.
WLAN	Front panel	Off	No built-in WLAN module is provided with the model.
LINK/ACT	Rear panel	Solid green	An EPRI0 link is present.
		Flashing green	Data is being transmitted or received.

LED	Location	Status	Description
		Off	No carrier signal is received.
LP/AL	Rear panel	Solid green	The EPRI0 port is in loopback state.
		Flashing green	One of the following alarms is generated—AIS, LFA, or RAI.
		Off	No loopback or alarm has occurred.

MSR20-12-W

Table 11 MSR20-12-W LED description

LED	Location	Status	Description
			
PWR	Front panel	Solid green	The power supply is connected.
		Off	The power supply is not connected.
SYS	Front panel	Fast flashing (green)	The system is starting up.
		Slow flashing (green)	The system is operating properly.
		Fast flashing (yellow)	A problem has occurred to the system.
		Off	The system has failed to operate properly.
ETH	Front panel	Solid green	A link is present.
		Flashing green	The port is transmitting or receiving data.
		Off	No link is present.
WLAN	Front panel	Slow flashing (green)	The system is operating properly.
		Fast flashing (green)	The device is working under a large amount of traffic.
		Off	The system is operating abnormally.
LINK/ACT	Rear panel	Solid green	An EPRI0 link is present.
		Flashing green	Data is being transmitted or received.
		Off	No carrier signal is received.
LP/AL	Rear panel	Solid green	The EPRI0 port is in loopback state.
		Flashing green	One of the following alarms is generated—AIS, LFA, or RAI.
		Off	No loopback or alarm has occurred.

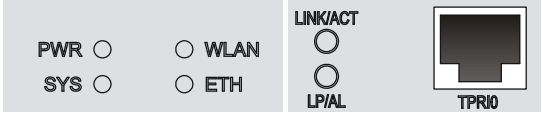
MSR20-12-T

Table 12 MSR20-12-T LED description

LED	Location	Status	Description
PWR	Front panel	Solid green	The power supply is connected.
		Off	The power supply is not connected.
SYS	Front panel	Fast flashing (green)	The system is starting up.
		Slow flashing (green)	The system is operating properly.
		Fast flashing (yellow)	A problem has occurred to the system.
		Off	The system has failed to operate properly.
ETH	Front panel	Solid green	A link is present.
		Flashing green	The port is transmitting or receiving data.
		Off	No link is present.
WLAN	Front panel	Off	No built-in WLAN module is provided with the model.
LINK/ACT	Rear panel	Solid green	A TPRI0 link is present.
		Flashing green	Data is being transmitted or received.
		Off	No carrier signal is received.
LP/AL	Rear panel	Solid green	The TPRI0 port is in loopback state.
		Flashing green	One of the following alarms is generated—AIS, LFA, or RAI.
		Off	No loopback or alarm has occurred.

MSR20-12-T-W(NA)

Table 13 MSR20-12-T-W(NA) LED description

LED	Location	Status	Description
			
PWR	Front panel	Solid green	The power supply is connected.
		Off	The power supply is not connected.

LED	Location	Status	Description
SYS	Front panel	Fast flashing (green)	The system is starting up.
		Slow flashing (green)	The system is operating properly.
		Fast flashing (yellow)	A problem has occurred to the system.
		Off	The system has failed to operate properly.
ETH	Front panel	Solid green	A link is present.
		Flashing green	The port is transmitting or receiving data.
		Off	No link is present.
WLAN	Front panel	Slow flashing (green)	The system is operating properly.
		Fast flashing (green)	The device is working under a large amount of traffic.
		Off	The system is operating abnormally.
LINK/ACT	Rear panel	Solid green	A TPRI0 link is present.
		Flashing green	Data is being transmitted or received.
		Off	No carrier signal is received.
LP/AL	Rear panel	Solid green	The TPRI0 port is in loopback state.
		Flashing green	One of the following alarms is generated—AIS, LFA, or RAI.
		Off	No loopback or alarm has occurred.

MSR20-13

Table 14 MSR20-13 LED description

LED	Location	Status	Description
PWR	Front panel	Solid green	The power supply is connected.
		Off	The power supply is not connected.
SYS	Front panel	Fast flashing (green)	The system is starting up.
		Slow flashing (green)	The system is operating properly.
		Fast flashing (yellow)	A problem has occurred to the system.
		Off	The system has failed to operate properly.

LED	Location	Status	Description
ETH	Front panel	Solid green	A link is present.
		Flashing green	The interface is transmitting or receiving data.
		Off	No link is present.
WLAN	Front panel	Off	No built-in WLAN module is provided with the model.
ACT	Front panel	Solid green	A BRI link is present.
		Off	No BRI link is present.
B1	Front panel	Solid green	Data is being transmitted or received in the B1 channel.
		Off	No data is being transmitted or received in the B1 channel.
B2	Front panel	Solid green	Data is being transmitted or received in the B2 channel.
		Off	No data is being transmitted or received in the B2 channel.
LINK/ACT	Rear panel	Solid green	A G.SHDSL.BIS link is present.
		Flashing green	Data is being transmitted or received.
		Off	No carrier signal is received.

MSR20-13-W/MSR20-13-W(NA)

Table 15 MSR20-13-W/MSR20-13-W(NA) LED description

LED	Location	Status	Description
PWR	Front panel	Solid green	The power supply is connected.
		Off	The power supply is not connected.
SYS	Front panel	Fast flashing (green)	The system is starting up.
		Slow flashing (green)	The system is operating properly.
		Fast flashing (yellow)	A problem has occurred to the system.
		Off	The system has failed to operate properly.
ETH	Front panel	Solid green	A link is present.
		Flashing green	The interface is transmitting or receiving data.
		Off	No link is present.

LED	Location	Status	Description
WLAN	Front panel	Slow flashing (green)	The system is operating properly.
		Fast flashing (green)	The device is working under a large amount of traffic.
		Off	The system is operating abnormally.
ACT	Front panel	Solid green	A BRI link is present.
		Off	No BRI link is present.
B1	Front panel	Solid green	Data is being transmitted or received in the B1 channel.
		Off	No data is being transmitted or received in the B1 channel.
B2	Front panel	Solid green	Data is being transmitted or received in the B2 channel.
		Off	No data is being transmitted or received in the B2 channel.
LINK/ACT	Rear panel	Solid green	A G.SHDSL.BIS link is present.
		Flashing green	Data is being transmitted or received.
		Off	No carrier signal is received.

Reset button

The MSR20-1X has a Reset button to restart the system and restore the factory defaults.

- If you press the button shortly, the router is restarted.
- If you press the button for at least five seconds, the router is restarted and restores to the factory defaults.

Appendix C Setting the fixed E1 port impedance

CAUTION:

The DIP switches are located at the mother board inside the router chassis. To operate the DIP switches, you must open the router chassis. For more information, see the chapter "Installing and upgrading internal modules."

By default, the impedance of the fixed E1 port on MSR20-12/20-12-W is 75 ohms. By using the internal DIP switches, you can change the interface impedance from 75 ohms to 120 ohms.

Figure 52 Default setting of DIP switches

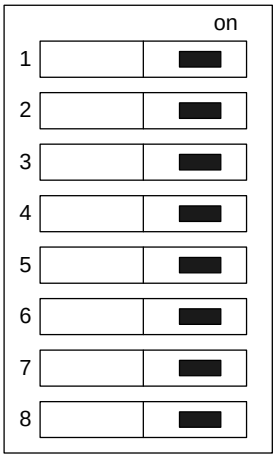


Table 1 DIP switch setting description

DIP	Description	Configuration of 75-ohm impedance	Configuration of 120-ohm impedance
1BIT	75-ohm/120-ohm selection switch	ON	OFF
2BIT		ON	OFF
3BIT		ON	OFF
4BIT		ON	OFF
5BIT		ON	OFF
6BIT	RxRing grounding mode selection switch	OFF: RxRing is grounded via capacitance. ON: RxRing is grounded directly.	N/A

DIP	Description	Configuration of 75-ohm impedance	Configuration of 120-ohm impedance
7BIT	RxShield grounding mode selection switch	N/A	ON: RxShield is grounded. OFF: RxShield is not grounded.
8BIT	SxShield grounding mode selection switch	N/A	OFF: RxShield is grounded via capacitance ON: RxShield is grounded directly.

NOTE:

- HP recommends that you select the DIP switch of the fixed E1 port in this way: when you connect 75-ohm cable, flip BIT1-8 to ON; when you connect 120-ohm cable, flip BIT1-8 to OFF.
- By default, all of the DIP switches are factory-configured to ON. In other words, the impedance of E1 port is 75 ohms.

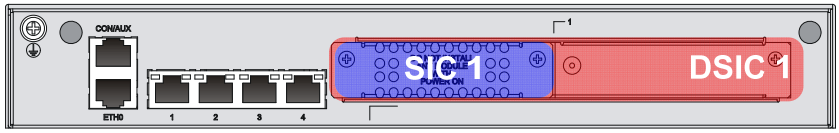
Appendix D Arranging slots and numbering interfaces

Slot arrangement

The router provides SIC slots. You can expand two SIC slots to one DSIC slot by removing the slot divider.

All fixed ports on the MSR20-1X belong to slot 0.

Table 16 MSR20-1X slot arrangement

Model	Slot arrangement
All models	
—SIC slot	
—DSIC slot	

Numbering interfaces

The interfaces of the router are numbered in the form of *interface-type X/Y*,

Where,

- *interface-type*—Type of an interface such as serial, asynchronous, or Ethernet port.
- *X*—Number of the slot where an interface module resides.
- *Y*—Sequence number of an interface on an interface module.

Interfaces on the same interface module have the same slot number X, and are numbered from 0 in ascending order from left to right when you face the interface module.

- For example, the fixed WAN port on the MSR20-1X is nubmered Ethernet 0/0, the four fixed Ethernet LAN ports are numbered Ethernet 0/1, Ethernet 0/2, Ethernet 0/3, and Ethernet 0/4.
- The interface module SIC-4FSW is installed in slot 1. The Ethernet ports on the interface module are numbered from left to right: Ethernet 1/0, Ethernet 1/1, Ethernet 1/2, and Ethernet 1/3.

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